REVISED 12/06

LSUE COURSE SYLLABUS

I.	**Chemistry 1202 Instructor: Chemistry Faculty**

II.	**Course description from the current LSUE catalog:**

Basic Chemistry. Lec. 3; Cr. 3.
Continuation of Chemistry 1201; more theory with emphasis on solution chemistry and a quantitative approach; descriptive chemistry of selected elements and compounds from the main groups and the first transition series. For science/engineering curricula.
Prerequisite: Chemistry 1201.

Aims.

To acquaint the first year student with basic principles of chemistry and provide an indepth foundation for subsequent courses.

III.	**Textbook(s) and other required materials:**

Chemistry, 9th edition by Raymond Chang, McGraw Hill Publishing. Workbooks to accompany the text are optional. Students are expected to use calculators.

IV.	**Evaluation/grading (policy and basis; number and frequency of tests and papers; weights of particular tests or papers; etc.):**

Three one-hour examinations on material and a comprehensive two-hour final examination are given. The ten-point scale is used. The details of the examinations will be discussed on the first day of class by the instructor.

V.	**Policies pertaining to attendance, late work, make-up work, etc.:**

Students are encouraged to attend every lecture. Attendance for tests is mandatory. If a student has a mitigating circumstance which absolutely prohibits him from being present for a test, he must get in touch with the instructor and, if his excuse is acceptable and verified, the instructor will proceed as necessary to accommodate the student.

VI.	**Course objectives:**

To give students sufficient knowledge of chemistry to either continue on to advanced chemistry courses or to function with a background in chemistry for advanced courses related to chemistry. To present a working relationship with problem solving in chemical

kinetics and equilibrium processes. To provide an introduction to thermochemical and electrochemical theory and initial problem solving capabilities.

VII.	Major instructional objectives:

1. To develop an understanding of the process of solution formation.

Distinguish between the various types of solutions

Understand energetics of solutions of electrolytes and non-electrolytes.

Relate effect of changing conditions to the solubility of materials.

Solve problems using concentration units, such as:

c. percent by weight
d. molarity and molality
e. normality
f. mole fraction

2. To understand the properties and chemical behavior of acids and bases.

Define various types of acids and bases.

Relate the relative strength of acids and bases and their relationship to conjugate pairs.

Predict hydrolysis reaction and strengths of acids, bases and their conjugates.

Use neutralization equilibria to prepare titrations and choose proper indicators based on equivalence points.

3. To develop insight into thermodynamic principles and their relationship to chemical equilibria and kinetics.

Relate endo- and exothermic heats of reaction to enthalpy, using standard state data and Hess' law.

Calculate enthalpy of reaction from standard enthalpy data of compounds.

Use bond energy data to understand strengths of chemical bonds and the energetics of bond breaking and bond making.

Relate enthalpy data to processes of electron loss and gain as well as crystal energy.

Understand basic principles of the first and second law of thermodynamics.

Equate entropy, free energy and enthalpy changes to the equilibrium constant.

4. To understand the relation between reaction rates and mechanisms from the principles of chemical kinetics.

Relate energy diagram to the rate of reaction and factors that effect their magnitude.

From knowledge of energy diagrams, relate nature of reactants, temperature, role of catalysts to energy of activation.

Relate transition state to structure of reactants.

Predict reaction status based on collision theory.

Understand effect of temperature on activation energy from collision theory.

Gain insight into roles of catalysts.

Understand role of concentration of reactants on rate and rate equation.

Calculate reaction rates from rate equation using proportionality constant.

5. To explore the relationship of electrochemical processes to chemical principles.
Use voltaic cells to explain basic electrochemical processes to chemical principles.
Understand the relative strengths of oxidation and reduction agents.
Calculate standard cell potentials from reduction potential data.
Explain Nernst equation and calculate cell potentials.
Relate cell potential to standard thermodynamic functions and spontaneity of reactions.

VIII.	**Brief summary of course content by major units of instruction:**

1. Solutions of electrolytes and non-electrolytes
   - 1.1 Nature of Solutions
     - a. Types of solutions
     - b. Energetics of solutions of electrolytes and non-electrolytes
     - c. Conditions affecting solubility
   - 1.2 Concentration Units
     - a. Percent by weight and volume
     - b. Molarity and molality
     - c. Normality
     - d. Mole fraction
   - 1.3 Electrolytes and non-electrolytes
     - a. Definitions – ionic and covalent
     - b. Organic and inorganic compounds
     - c. Polar covalent compounds
     - d. Ionic equations

2. Acids and bases
   - 1.1 Definitions
     - a. Bronsted-Lowery
     - b. Lewis
     - c. Properties
   - 1.2 Relative Strengths
     - d. Table of strong and weak acids-bases
     - e. Conjugate pairs
     - f. Hydrolysis
     - g. Structure of hydroxy compounds
   - 1.3 Neutralization
     - a. Titrations
     - b. Equivalence point
     - c. Indicators

3. Thermochemistry
   - 1.1 Enthalpy
     - e. Endo- and exothermic

f. Standard states
g. Hess' Law

1.2 Enthalpy of reaction
a. Standard enthalpy of formation – compounds and elements
b. Change in enthalpy – reactions
c. Problems

1.3 Bond energy
a. Bond dissociation energy
b. Bond making – bond breaking – energetics
c. Average bond energy

1.4 Other Enthalpies
a. Electron loss and gain
b. Crystal energy
c. Born-Haber cycle

4. Chemical Kinetics

1.1 Rate of Reaction
a. Factors affecting rate
b. Nature of reactant
c. Temperature – activation energy, heat of reactions, energy diagrams transition state theory
d. Catalyst – mechanisms of catalysis
e. Concentration – collision theory

1.2 Rate equations
g. Basic rate/concentration relationships
h. Rate constant, proportionality
i. Rate law
j. Order of reaction

5. Chemical equilibrium

1.8 Reversibility of reactions
h. Forward and reverse rates
i. Establishment of equilibria

1.9 Equilibrium constant expression
a. Formulation
b. Equilibrium constant – meaning
c. Magnitude of K

1.10 Factors affecting K
a. Concentration
b. Nature of reactants
c. Temperature
d. Pressure

1.11 Problem Solving using K
a. Basic relationship
b. Initial and equilibrium concentrations

c. Pressure constant Kp

6. Ionic equilibria in Solutions – Acids and Bases
   1.1 Ionization process
      a. Strong and weak electrolytes
      b. Ionization constant – meaning
      c. Relating K_i to K
   1.2 Weak acids and bases
      i. Extent of ionization
      j. Acetic acid – ionization constant
      k. Problems involving K_a and K_b
   1.3 Ionization of water
      a. Ion product constant
      b. pH - hydrogen ion concentrations
      c. Relation to acid-base strength
      d. Problems involving pH
      e. Hydrolysis
   1.4 Common ion effect – buffers
      a. Shifting equilibria in weak acid-base systems
      b. Effect of adding common ion
      c. Buffers
      d. Problems involving buffer systems

7. Solubility and Ksp
   1.1 Solubility product constant – Ksp
      a. Meaning of Ksp
      b. Expressing Ksp
      c. Relation to solubility
      d. Problems
   1.2 Common ions
      a. Effect on solubility
      b. Calculations

8. Redox equilibria - electrochemistry

   1.1 Voltaic cells
      a. Oxidation and reduction
      b. Anode and cathode
      c. Solids, liquid and gas electrodes
   1.2 Relative reduction potential
      a. Standard electrode potential
      b. Relative potentials for oxidation and reduction – measurement, utility and meaning
      c. Tables of reduction potentials – relative nature
   1.3 Calculations of standard cell potential
      a. Expressing cell representations

b. Definition of ° - standard cell potential
c. Significance of value
d. Calculations of °cell

1.4 Calculation of non-standard cell potential
a. Nerst equation
b. Cell voltages – calculation and meaning

1.5 Significance of cell potential
a. Relating to equilibrium constant
b. Relating to free energy
c. Spontaneity – calculations

1.6 Balancing Redox equations
a. Rules of oxidation number method
b. Balancing equations

IX. Methods of instruction:

The scheduled lectures accompanied with the use of demonstration and transparencies will constitute the core of the instructional method.

X. Brief overview of special instructions:

None.

XI. Bibliography of supplemental references and/or source materials:

None.

ADS Americans with Disabilities Act) Statement

Any student who is a "qualified individual with a disability" as defined by Section 504 of the Rehabilitation Act and Title II of the ADA, and who will need accommodated services (e.g., note takers, extended test time, audiotape, tutorials, etc.) for this course must register and request services through the Office of Academic Assistance Programs, S-150.

CSD CODE OF STUDENT CONDUCT

LSUE enforces discipline on campus to protect the academic environment of the campus and the health and safety of all members of the University community. To accomplish this objective, the University enforces standards of conduct for its students. Students who violate these standards can be denied membership in the LSUE community through imposition of disciplinary sanctions.

The LSUE Code of Student Conduct can be found on the LSUE website (lsue.edu). Follow the “Current Students” link from the homepage, and then click on “Student Handbook.”